Chapter E2: Technical Description of Facilities

This Chapter presents additional information related to the Pittsburg and Contra Costa facilities. Section E2-1 presents detailed EIA data on the generating units addressed by this case study and within the scope of the Phase II rulemaking. Section E2-2 describes the configuration of the intake structure(s) at the facilities. Section E2-3 presents an evaluation of the specific impacts of the proposed Phase II rule, i.e., defines the baseline for calculating benefits. Section E2-4 describes other (non 316-B) impacts associated with the proposed rule. Section E2-5 provides a benefits summary.

CHAPTER CONTENTS

E2-1 OPERATIONAL PROFILE

Pittsburg

During 1999, the Pittsburg power plant operated seven active units.[1] All seven units employ a steam-electric prime mover and use cooling water withdrawn from the San Joaquin River. Four of Pittsburg's units were built in 1954 (Generator IDs 1-4). Each of these units has a generation capacity of 163 MW. Two units of 325 MW each were added between September 1960 and June 1961 (Generator IDs 5-6). Pittsburg's last generator, a 682 MW unit, was installed in December 1972 (Generator ID 7).

Two of Pittsburg's seven units were classified as "operating" in 1999, while four units were on standby and one unit was on cold standby. Pittsburg's total gross generation in 1999 was approximately 3.8 million MWh. Unit 7 accounted for almost 1.8 million MWh, or 48 percent, of this total. The capacity utilization of Pittsburg's units ranged from 5.7 to 14.4 percent for units 1 to 4, 20.0 percent for unit 5, and 28.2 to 30 percent for units 6 and 7.[2]

Table E2-1 presents details for Pittsburg's seven active units.

Table E2-1: Pittsburg Generator Characteristics (1999)

Generator ID	Capacity (MW)	Prime Mover[a]	Energy Source[b]	In-Service Date	Operating Status	Gross Generation (MWh)	Capacity Utilization	ID of Associated CWIS
PP01	163	ST	NG	Sep. 1954	Standby	206,000	14.4%	1
PP02	163	ST	NG	Aug. 1954	Standby	185,000	13.0%	2
PP03	163	ST	NG	Dec. 1954	Standby	131,000	9.2%	3
PP04	163	ST	NG	Dec. 1954	Cold Standby	82,000	5.7%	4
PP05	325	ST	NG	Sep. 1960	Standby	569,000	20.0%	5
PP06	325	ST	NG	Jun. 1961	Operating	804,000	28.2%	6
PP07	682	ST	NG	Dec. 1972	Operating	1,790,000	30.0%	7
Total	**1,984**					**3,767,000**	**21.7%**	

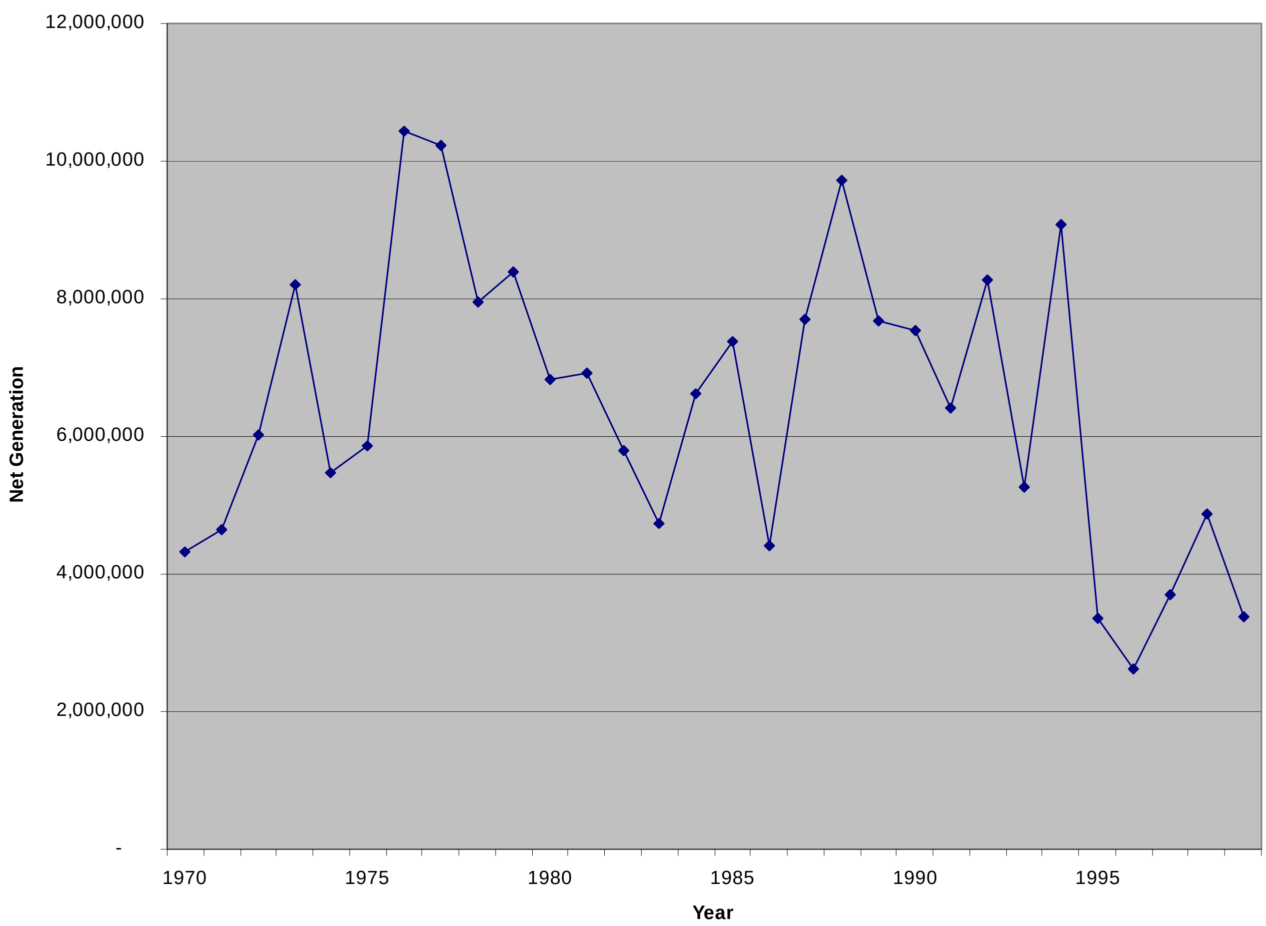
[a] Prime mover categories: ST = steam turbine.
[b] Energy source categories: NG = natural gas.
Source: Form EIA-860B, Form EIA-767 for CWIS ID.

[1] For the purposes of this analysis, "active" units include generating units that are operating, on standby, on cold standby, on test, on maintenance/repairs, or out of service (all year). Active units do not include units that are on indefinite shutdown or retired.

[2] For this analysis, capacity utilization was calculated by dividing the unit's actual gross generation by the potential gross generation if the unit ran at full capacity all the time (i.e., capacity * 24 hours * 365 days).

Figure E2-1 below presents Pittsburg's electricity generation history between 1970 and 1999.

Figure E2-1: Pittsburg Net Electricity Generation 1970 - 1999 (in MWh)



Source: Form EIA-906, Form EIA-860B.

Contra Costa

During 1999, Contra Costa operated two active steam-electric generating units. Each unit has a generation capacity of approximately 340 MW, began operation in 1964, and uses cooling water withdrawn from the San Joaquin River. In addition, Contra Costa has five retired steam-electric units with a combined capacity of 580 MW. All five units were retired in 1994.

Both of Contra Costa's active units were operating in 1999. They accounted for a gross electricity generation of almost 2.5 million MWh. The capacity utilization of these units in 1999 was 42.1 percent and 40.0 percent, respectively.[3]

On May 29, 2001, the California Energy Commission approved a proposed capacity addition to the Contra Costa power plant. The proposed Unit 8 would be a 530 MW natural gas-fired, combined cycle unit located within the existing Contra Costa site complex. According to the project description, Unit 8 would not require the withdrawal of additional water from the San

[3] For this analysis, capacity utilization was calculated by dividing the unit's actual gross generation by the potential gross generation if the unit ran at full capacity all the time (i.e., capacity * 24 hours * 365 days).

Joaquin River because it would re-use water withdrawn for use in Units 6 and 7. The project proposal also includes construction of a new 10-cell cooling tower. Since use of the new cooling tower would require approximately 5,000 gallons per minute (GPM) of makeup water, consumptive use of water at the plant is projected to increase (California Energy Commission, 2001). The startup date for Unit 8 was originally scheduled for 2003. However, as of June 1, 2001, it was unclear when construction would begin because of uncertainty about California energy market rules (Mirant Corporation, 2001a).

Table E2-2 presents details for Contra Costa's two active, five retired, and one proposed units.

Table E2-2: Generator Detail of the Contra Costa Plant (1999)

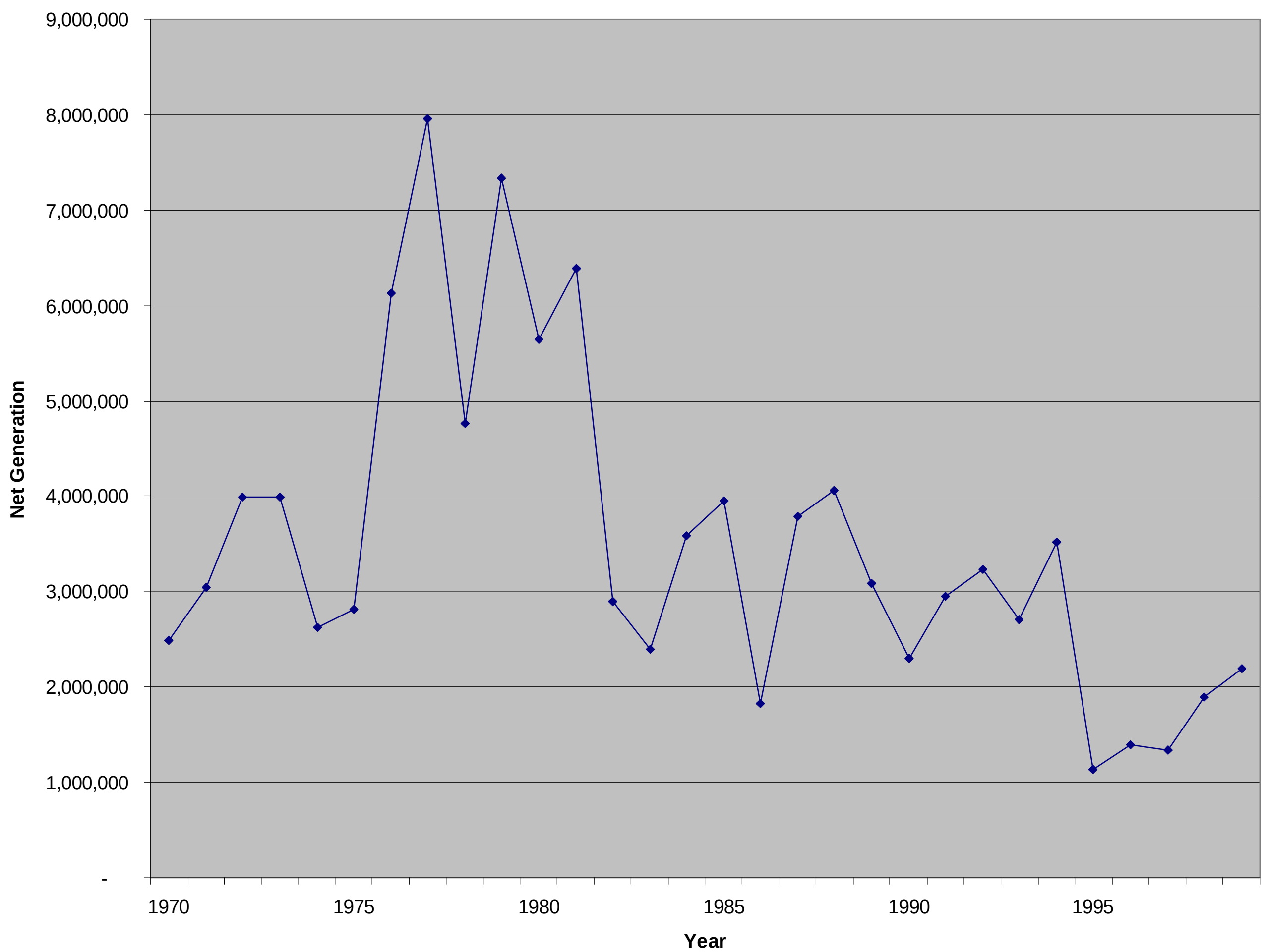
Generator ID	Capacity (MW)	Prime Mover[a]	Energy Source[b]	In-Service Date	Operating Status	Gross Generation (MWh)	Capacity Utilization	ID of Associated CWIS
Existing Units								
1	116	ST	NG	Jun. 1951	Retired - Jun. 1994			
2	116	ST	NG	Aug. 1951	Retired - Aug. 1994			
3	116	ST	NG	Aug. 1951	Retired - Aug. 1994			
4	117	ST	NG	Jul. 1953	Retired - Jul. 1994			
5	115	ST	NG	Oct. 1953	Retired - Oct. 1994			
CC06	339	ST	NG	Jan. 1964	Operating	1,250,000	42.1%	6
CC07	337	ST	NG	Jan. 1964	Operating	1,180,000	40.0%	7
Total[c]	**676**					**2,430,000**	**41.0%**	
Proposed Units								
Unit 8	530	CC	NG	n/a	Proposed	n/a	n/a	

[a] Prime mover categories: ST = Steam turbine; CC = Combined-cycle.
[b] Energy source categories: NG = natural gas.
[c] Totals only include non-retired units.

Source: Form EIA-860B, Form EIA-767 for CWIS ID. Information for retired units from Form EIA-860A. Information for proposed unit from California Energy Commission, 2001.

Figure E2-2 below presents Contra Costa's electricity generation history between 1970 and 1999.

Figure E2-2: Contra Costa Net Electricity Generation 1970 -1999 (in MWh)



Source: Form EIA-906, Form EIA-860B.

E2-2 CWIS Configuration and Water Withdrawal

The Pittsburg and Contra Costa facilities withdraw water from estuarine waterbodies. At Pittsburg Landing, the Agency has estimated that the design intake flow (161 cubic feet per second (cfs)) is approximately 0.70 percent of the tidal excursion volume in the area. At Contra Costa, the design intake flow is approximately 0.47 percent of the tidal excursion.

Monitoring studies in 1978 and 1979 demonstrated that several hundred million fish were impinged or entrained each year by the Pittsburg and Contra Costa Power Plants (Ecological Analysts Inc., 1981a; 1981c). Striped bass accounted for about half of these losses, and initial efforts to reduce I&E focused on development of the best technology available (BTA) to reduce losses of striped bass. In recent years, attention has shifted to special status fish species, but BTA for these species is still under review (Southern Energy California, 2000).

To reduce striped bass losses, a fish pump removal system was installed at Units 1-5 of the Contra Costa facility to remove fish from the area in front of the screens. The facility determined that the pump was effective in reducing impingement rates and maintaining high survival of impinged fish that were returned to the water body. In addition, intake design criteria were implemented at Contra Costa Units 6 and 7 and at Pittsburg Units 1-7 to minimize impingement, including an intake approach velocity of 0.8 fps, configuration of the intake structure to include lateral fish escape routes, and location of intake screen parallel to the shoreline.

In 1986, the San Francisco Bay and Central Valley Regional Water Quality Control Boards established additional NPDES permitting requirements for the Pittsburg and Contra Costa facilities to protect striped bass (Permit CA0004880 for the Pittsburg Power Plant and Permit CA0004863 for the Contra Costa Power Plant). This striped bass BTA program is discussed in Southern Energy California (2000). Among the operational adjustments still in place is the preferential use of Pittsburg Unit 7, which is equipped with a closed-cycle system, during spring when young striped bass are present. Entrainment of striped bass varies in direct proportion to the volume of cooling water drawn into the Pittsburg and Contra Costa intakes (Ecological Analysts Inc., 1981a; 1981c). Because closed-cycle cooling requires far less water, preferential operation of Pittsburg Unit 7 during the spring striped bass entrainment period (defined as May to mid-July unless modified by results of field sampling) greatly reduces striped bass losses.

In addition to preferential operation of Pittsburg Unit 7, PG&E was required to install variable-speed circulating water pump controls for the once through cooling systems of Pittsburg Units 1-6 and Contra Costa Units 6-7 (Southern Energy California, 2000). Variable speed drives (VSD) are designed to reduce the volume of cooling water provided to a unit during periods when unit load is low. PG&E was required to install VSDs for the once-through cooling systems of Pittsburg Units 1-6 and Contra Costa Units 6-7 (Southern Energy California, 2000). The facilities' current NPDES permits also specify actions to minimize impingement of striped bass, including the frequency of intake screen rotation and cleaning and debris removal to maintain an optimal bar-rack velocity (Permit CA0004880 for the Pittsburg Power Plant and Permit CA0004863 for the Contra Costa Power Plant).

Other structural and operational modifications (discussed in Southern Energy California, 2000) included:

- Operation and dispatch of units during spring (May-July) to reduce unit operations, cooling water flows, and the frequency of discharge temperatures above 86 degrees F.
- Operation of mechanical crossovers to reduce cooling water volumes at Contra Costa Units 1-3.
- Installation of a hydrogen cooler at Contra Costa Units 6 and 7.
- Entrainment monitoring of striped bass to determine the optimal time to implement operational changes to protect striped bass.
- Entrainment monitoring to dispatch units based on distribution of larval striped bass and to evaluate the effectiveness of actions to reduce striped bass losses.

Originally, a performance standard was applied to evaluate the striped bass BTA program. The standard required a 79% reduction in striped bass losses from the historical baseline (Environmental Science Associates, 1998). However, in 1993, striped bass monitoring at the Pittsburg and Contra Costa facilities was discontinued to avoid harm to delta smelt following its federal and state listing as a threatened species. As a result, the requirement for a 79% reduction in losses was removed in 1995, and striped bass loss estimates are now estimated on the basis of conditions in a prior year with similar flow conditions (NPDES Permit No. CA0004880 for the Pittsburg Power Plant and NPDES Permit No. CA0004863 for the Contra Costa Power Plant).

Initially, the facilities were required to stock hatchery striped bass to mitigate for unavoidable I&E of striped bass (Environmental Science Associates, 1998). However, because of concern that hatchery-reared striped bass might prey on endangered juvenile winter-run chinook salmon, the stocking program was discontinued in 1992. In 1995, the stocking provision was replaced by an annual mitigation dollar amount to provide funding for aquatic habitat restoration (Environmental Science Associates, 1998). Under the mitigation agreement, any money owed by the facilities is paid into the California Department of Fish and Game Striped Bass Fund under a Memorandum of Understanding (MOU).

The Pittsburg and Contra Costa facilities are required to evaluate the performance of the striped bass BTA program on an annual basis (Environmental Science Associates, 1998). A computer model is used to estimate losses based on hourly cooling water volume for each unit, hourly discharge water temperatures, and the measured or assumed density of striped bass susceptible to entrainment during the May-July entrainment period. As a result of the sampling prohibition to avoid harm to delta smelt, striped bass entrainment is now estimated using data for a year with similar flow conditions. For any given year, the model calculates the percent reduction in striped bass losses by comparing current losses with the average for 1976, 1978, and 1979, before structural and operational BTAs were applied. Pre-BTA losses, expressed as 150 mm striped bass equivalents, amounted to 116,486 in 1976, 80,476 in 1978, and 143,031 in 1979, representing an average of 113,331 striped bass per year (PG&E, 1995).

The ability to reduce striped bass losses varies between years in response to changes in system demand for operation of the units, availability of alternative sources of generation, and the temporal and spatial distribution of larval striped bass (Environmental Science Associates, 1998). However, in all years the facilities report a substantial reduction in striped bass losses resulting from the use of circulating water pump VSDs and other technologies. Over the period 1995 to 1999, striped bass losses were reduced by 78% to 94% (Table E2-3).

Table E2-3: Facility Estimates of Annual Reductions in Striped Bass Losses With Application of BTA at the Pittsburg and Contra Costa Power Plants

Year	% Reduction in Pre-BTA Losses[a]
1995	93.9
1996	82.0
1997	78.0
1998	91.7
1999	89.0

[a] Annual pre-BTA losses were 113,331 based on the average for 1976, 1978, and 1979.
Sources: Best Technology Available Technical Reports for the Pittsburg and Contra Costa Power Plants for the years 1995 to 1999 (PG&E, 1995, 1997, 1998, 1999; Southern Energy California, 2000).

Other special fish protection measures have recently been proposed by Southern Energy, the operator of the Pittsburg and Contra Costa facilities. The June 2000 draft HCP for the facilities proposes to reduce current losses of sensitive fish species by installation of an “aquatic filter barrier.” Known commercially as a Gunderboom “Marine Life Exclusion System,” this technology is a filter curtain comprised of treated polypropylene/polyester fabric that encloses a plant’s intake and prevents the passage of small particles, including fish eggs and larvae, into the intake (http://www.gunderboom.com).

Based on studies at the Lovett facility in New York, it is expected that this technology will reduce current entrainment losses at Pittsburg and Contra Costa by at least 80% (Steve Gallo, Southern Energy, personal communication, 9/18/00). Although this may not have a significant impact on striped bass losses, which have already been reduced considerably as a result of the striped bass BTA program (Table E2-3), it may have a considerable effect on entrainment of special status species, which can be substantial in years of high densities near the facilities.